

Sheet 3

- If A and B are independent events, prove that:
 - A^c and B^c are independent events.
 - A and B^c are independent events
- Three fair coins are tossed. Find the probability that they are all heads if:
 - The first coin is head.
 - One of the coins is head.
- A pair of fair die is thrown. If the two numbers appearing are different, find the probability that:
 - The sum is six
 - An ace appears.
 - The sum is four or less.
- In a certain collage, 25% of the students failed in mathematics, 15% of the students failed in chemistry, and 10% of the students failed in both. A student is selected at random.
 - If he failed in Chemistry, what is the probability that he failed in Mathematics?
 - If he failed in Mathematics, what is the probability that he failed in Chemistry?
 - What is the probability that he failed in Mathematics or Chemistry?
- Let A and B be events with $P(A) = 1/2$, $P(B) = 1/3$ and $P(A \cap B) = 1/4$. Find:
 - $P(B|A)$
 - $P(A|B)$
 - $P(A \cup B)$
 - $P(A^c|B^c)$
 - $P(B^c|A^c)$
- Let A and B be events with $P(A) = 3/8$, $P(B) = 5/8$ and $P(A \cup B) = 3/4$ Find :
 - $P(A|B)$
 - $P(B|A)$
- Let A and B be events with $P(A) = 1/3$, $P(B) = 1/4$, and $P(A \cup B) = 1/2$ Find:
 - $P(A|B)$
 - $P(B|A)$
 - $P(A \cap B^c)$
 - $P(A|B^c)$
- Let A and B be independent events with $P(A) = 1/2$ and $P(A \cup B) = 2/3$ Find:
 - $P(B)$
 - $P(A|B)$
 - $P(B^c|A)$
- Let $S = \{a, b, c, d, e, f\}$ with $P(a) = P(b) = 1/16$, $P(c) = 1/8$, $P(d) = 3/16$, $P(e) = 1/4$ and $P(f) = 5/16$. Let $A = \{a, c, e\}$, $B = \{c, d, e, f\}$ and $C = \{b, c, f\}$ Find:
 - $P(A|B)$
 - $P(B|C)$
 - $P(C|AC)$
 - $P(AC|C)$
- The probability that a man will live 10 more years is $1/4$, and the probability that his wife will live 10 more years is $1/3$. Find the probability that:
 - Both will live 10 more years.
 - At least one will live 10 more years.
 - Neither will live 10 more years.
 - Only the wife will live 10 more years.
- Let A be the event that a family has children of both genders, and let B be the event that a family has at most one boy.
 - Show that A and B are independent events if family has 3 children.
 - Show that A and B are dependent events if family has 2 children.
- Box A contains 8 items of which three are defective, and Box B contains 5 items of which 2 are defective. An item is drawn at random of each box.
 - What is the probability that both items are non-defective?
 - What is the probability that one of the item is defective and one is not?

- c. If one item is defective and one is not, what is the probability that the defective item come from box A?
13. A certain soccer team wins (W) with probability 0.6, losses with probability 0.3 and ties (T) with probability 0.1 . The team plays three games over the weekend.
- a. Determine the probability that the team wins at least twice and does not lose; show the elements of the event.
 - b. Determine the elements of event B that the team wins, losses, ties.
14. A rifleman hits (H) his target with probability 0.4 and misses (M) with probability 0.6 . He fires four times.
- a. Determine the elements of event A that the man hits the target exactly twice. Find $P(A)$.
 - b. Find the probability that the man hits the target at least once.
15. A class has 12 boys and 4 girls if three students are selected at random from the class, what is the probability that they are all boys?
16. A man draws 5 cards after the other from an ordinary pack of 52 cards. What is the probability that they are all spades?
17. A box contains 7 red marbles and 3 white. Three marbles are drawn from the box one after the other. Find the probability that the first two are red and the third is white.
18. The students in a class are selected at random one after the other. Find the probability that the boys and girls in the class are alternates if the class consists of 4 boys & 3 girls the first student must be a boy.